MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2019/2020

DCS5068-DATA STRUCTURE AND ALGORITHMS

(DIT)

11 March 2020
2.30 pm – 4.30 pm
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This examination paper consists of SIX **(6)** pages excluding cover page.
2. There are **FOUR (4)** structured questions.
3. Write all your answers in the Answer Booklet provided.

Instruction: Write your answers in the answer booklet provided. Total is **50 marks**.

QUESTION 1 [10 MARKS]

a) The following program is written to get a software details from the user. Write a code to complete the program based on the instructions given.

```
#include<iostream>
#include<string.h>
using namespace std;

class software
{
      string name; int id,qtty; float price,total;
      public:
            .....(i).....
            {
                  .....
            }

            .....(ii).....
            {
                  .....
            }

            .....(iii).....
            {
                  .....
            }

            .....(iv).....
            {
                  .....
            }

};
int main()
{
      software s;
      string name;
      int id,qtty;
      float price;

      cout<<"Enter software name :";      getline(cin,name);
      cout<<"Enter software quantity :";  cin>>qtty;
      cout<<"Enter software ID :";        cin>>id;
      cout<<"Enter software price :";     cin>>price;
      s.setdata(name,id,qtty,price);
      s.calculate_total();
      s.display();
}
```

Continued...

Sample Output

```
A list of computer software.
Enter software name :Microsoft Word
Enter software quantity :4
Enter software ID :112211
Enter software price :345.00
Software Name           :Microsoft Word
Software Quantity       :4
Software ID             :112211
Software Price          :RM 345
Total                   :RM 1380
--------------------------------
```

i. Write a function called *setdata(...)* that has four parameters and initialize the parameters to *name*, *id*, *qtty* and *price*. (2 marks)

ii. Write a function called *calculate_total()* that calculate the *total* price. (2 marks)

iii. Write a function called *display()* that display all information as shown in the sample output. (2 marks)

iv. Write a constructor for class *software* that displays a welcome note "*A list of computer software.*" (1 mark)

b) Declare a structure named *stationery* which consists of the following three data members. Create an array object type structure named *stat* which has five elements. (3 marks)

- *name (string)*
- *quantity (integer)*
- *price (float)*

Continued...

QUESTION 2 [15 MARKS]

a) Given the values of integers **A, B, C** and **D** are **3, 5, 2, 4** respectively. Calculate the value based on the following expressions below.

i. Postfix : A B C + 2 D + * + (2 marks)

ii. Prefix : + - * A B – 4 A C (2 marks)

b) ***X*** is a queue of integers with five elements and ***Y*** is a stack of integers with five elements. There are two integers ***A*** and ***B***. There are two pointer integers ***H** for head and ***T** for tail.

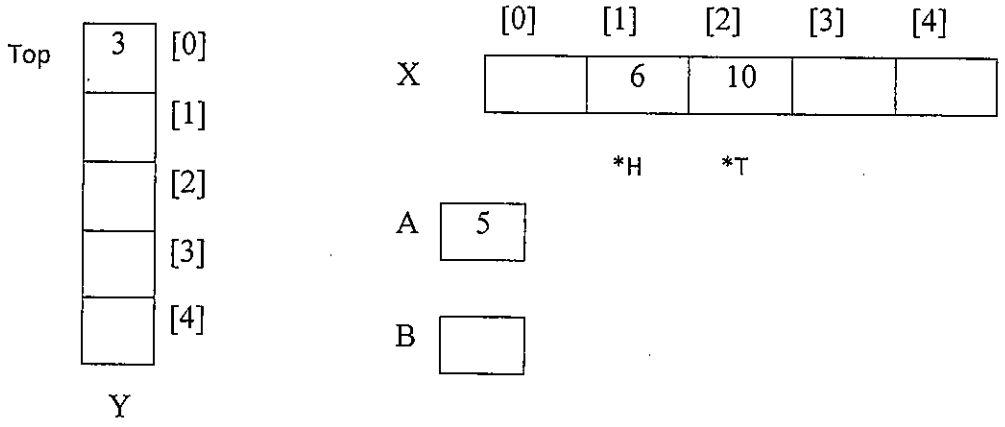


Figure 1

Draw the sequence diagrams of ***A***, ***B***, ***X*** and ***Y*** after each of the following operations:

i. `Y.push( A % 2);` (1 mark)

ii. `B = X.serve( ) * 2;` (2 marks)

iii.
```
if(Y.push(B) < Y.push(A*B))
    X.append(B + A);
```
(3 marks)

Continued...

c) Consider a linked list represented by the following declaration and diagram of the linked data is displayed in the **Figure 2**. Draw a sequence of diagram after the following lines of code have been executed. (5 marks)

```
struct node
{
     int data;
     node *link;
}*head, *ptr, *temp;
```

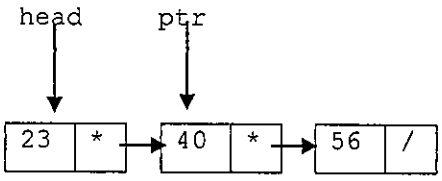


Figure 2

i. `temp = new node;`
   `temp->data = 35;`

ii. `temp-> link = ptr -> link;`

iii. `head -> link -> link = temp;`

iv. `ptr -> link = temp -> link;`

v. `temp -> link = NULL;`
   `delete temp;`

Continued...

QUESTION 3 [15 MARKS]

a) By using binary search, draw a sequence diagram and show step by step on how to find the target **27** in the data **34, 12, 16, 48, 50, 27, 66, 80** and **72** based on the **Figure 3** below. The following are the variables declared in the binary search algorithm.
[Hint: Sort in the ascending order] (5 marks)

```
int table [9], target, first, last, mid;
```

Integer									
Index	[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]

Figure 3

b) Assume a hash table with **8** locations and the hashing function **h(x) = x % 8**. Show the index for each key and the result of the hash table when the following integers are inserted in the order given. Use Quadratic Probing method to solve the collision.
(6 marks)

321, 426, 788, 102, 900, 558

c) Given an array contains the elements shown in the **Figure 4** below. By using **Merge Sort,** sort the following sequence of number in **ascending order.** Draw the sequence of diagram to depict the process. (4 marks)

29	102	88	99	77	38	82	17	55

Figure 4

Continued...

QUESTION 4 [10 MARKS]

a) Write the **InOrder** and **PostOrder** traversal based on the tree given in **Figure 5**. (2 marks)

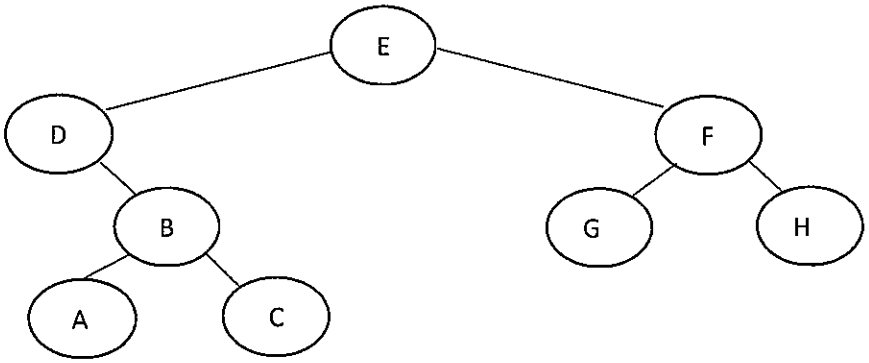


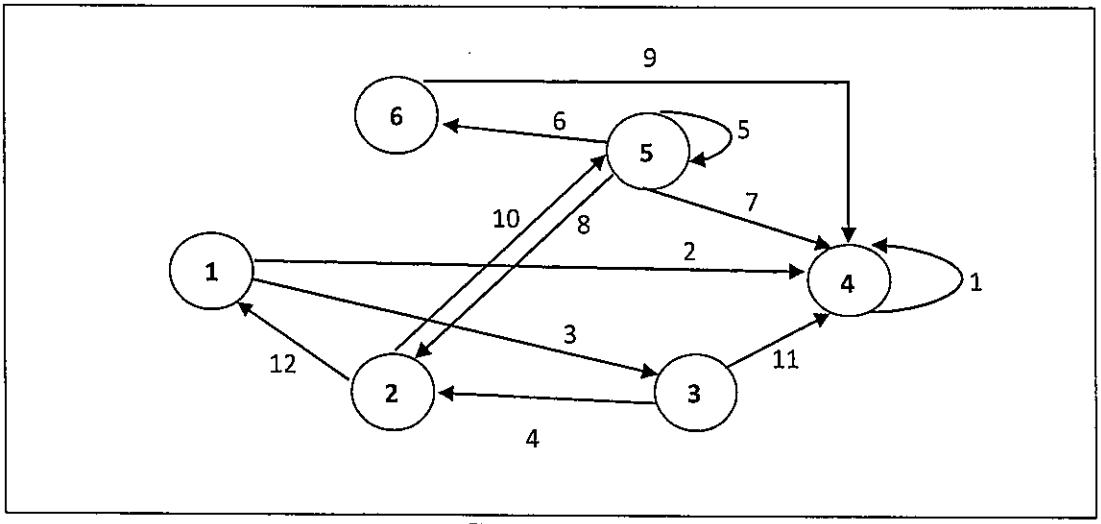
Figure 5

b) Draw a **binary search tree** for the algebraic expression below: (4 marks)

$$(A + (B * C)) * C - (D + E * G) / B$$

c) Answer the following question based on the given **Graph A**.

i. Derive an adjacency matrix. (3 marks)



Graph A

ii. List one path that constitute as cycle. (1 mark)

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